PCT EP 99 8783

09/831824

PATENTTI- JA REKISTERIHALLITUS
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Helsinki 19.11.1999

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25/5

IB P99/8783

E T U O I K E U S T O D I S T U S
P R I O R I T Y D O C U M E N T

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Patenttihakemus nro
Patent application no

982472

Tekemispäivä
Filing date

16.11.1998

Kansainvälinen luokka
International class

H04L

Keksinnön nimitys
Title of invention

"Signalling in a Telecommunications System"
(Signallointi telekommunikaatiojärjestelmässä)

Hakemus on hakemusdiaariin **11.02.99** tehdyn merkinnän mukaan siirtynyt **Telefonaktiebolaget L M Ericsson nimiselle yhtiölle, Stockholm, Sweden.**

The application has according to an entry made in the register of patent applications on **11.02.99** been assigned to **Telefonaktiebolaget L M Ericsson, Stockholm, Sweden.**

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Signalling in a Telecommunications System

Field of the Invention

The present invention relates to signalling in a telecommunications system and more particularly to the transmission of signalling data over a packet switched network.

Background to the Invention

Conventional telecommunications networks for conveying voice and other user information have in general relied upon dedicated telecommunications network infrastructure and transmission protocols. However, with the recent explosive growth in digital data transmission, driven in particular by the use of intranets and the Internet, there has been a move towards the use of more generic infrastructure and transmission protocols in the telecommunications industry. This move is driven primarily by the desire for interoperability between telecommunications networks and other data networks, and secondarily by the cost and performance advantages which general data network systems offer over conventional telecommunications systems.

In 1996, the International Telecommunications Union (ITU) defined a standard for the transmission of multimedia data over Local Area Networks (LANs) as well as "internetworks" composed of multiple interconnected LANs. This standard is known as H.323, whilst the 1998 revision is known as H.323 Version 2. A fundamental and essential component of H.323 is the provision for the transmission of digitised and compressed voice data. However, H.323 also makes optional provision for the transmission of video and other data forms.

H.323 makes mandatory the use of the ITU standard Q.931 for the negotiation of a call set-up between two H.323 terminals, to establish a channel therebetween over which the terminals may send user and signalling data. In addition, Q.931 is mandatory for certain call maintenance and termination functions.

Perhaps the most advanced telecommunications network protocol is that known as International Standard Digital Network (ISDN). In the link between a subscriber and that subscriber's local exchange (the subscriber "access point"), ISDN uses a signalling protocol known as Digital Subscriber Signalling System No.1 (DSS1), whilst a further protocol known as ISDN User Part (ISUP) is used to convey signalling data within the network, i.e. inter-exchange signalling. ISUP is also used more generally in inter-exchange signalling even in networks which do not make use of an ISDN access network, e.g. where the access network is a Public Switched Telephone Network (PSTN).

In the current competitive telecommunications market, it is vital for a telecom operator to provide a wide and varied range of value added services, as well as to minimise the cost of services to the end users. As such, existing telecommunications network protocols, and in particular ISUP, have evolved to provide for the transfer of many messages and parameters relating to such services between the various nodes (or signalling points) of the networks.

As the Q.931 signalling protocol is largely based upon the DSS1 protocol, interworking between ISUP and H.323 is generally satisfactory. It is therefore possible to replace intermediate portions of an ISUP network with an

H.323 network (or rather a TCP/IP network which uses the H.323 protocol). For example, the connection between two telephone switches, e.g. exchanges, could be made via an H.323 network.

Summary of the Present Invention

The inventors of the present invention have discovered that the existing Q.931 based signalling protocol employed by H.323 is not able to accommodate certain messages generated within an ISUP based network. More particularly, it has been discovered that the existing Q.931 based signalling protocol is unable to accommodate the Network Discard Indicator message which may be generated at a switch of a telecommunication network in the event that the switch does not support User-to-User signalling information contained in a received Q.931 message. This deficiency in the Q.931 based signalling protocol means that there is no way in which the switch, from which the User-to-User signalling information originated, can be informed for example that the receiving switch has discarded the signalling information. In certain circumstances this may lead to overcharging of the calling party.

It is an object of the present invention to overcome or at least mitigate the above noted disadvantages of existing telecommunication signalling systems. It is a further object of the present invention to provide a telecommunications system in which a packet switched network is used to carry user voice and data information and signalling data and in which a Network Discard Indicator message may be transmitted over the network between a pair of switches.

According to a first aspect of the present invention there is provided a method of communicating signalling

data between a pair of telecommunication switches employing ISUP signalling, via a packet switched data network, the method comprising using H.323 protocol to communicate over the data network where signalling data is carried by a Q.931 based protocol extended to provide for the transmission of the ISUP Network Discard Indicator message.

Preferably, the extended Q.931 protocol employed by the present invention is arranged to be applied within an H.323 protocol stack. More preferably, said connection or part of a connection formed between the subscriber parties is provided over a TCP/IP based network. This network may be a LAN, an internetwork, the Internet, or a combination of two or more of these. In these cases, the H.323 protocol stack is provided over a TCP/IP protocol stack.

According to a second aspect of the present invention there is provided apparatus for communicating signalling data between a pair of telecommunication network switches employing ISUP signalling, via a packet switched data network, the apparatus comprising means for using H.323 protocol to communicate over the data network where signalling data is carried by a Q.931 based protocol extended to provide for the transmission of Network Discard Indicator messages.

Brief Description of the Drawings

For a better understanding of the present invention and in order to show how the same may be carried into effect reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 illustrates schematically a telecommunications network in which user and signalling

data is carried between exchanges of the network via an IP network; and

Figure 2 is a flow diagram illustrating the transmission of Network Discard Indicator messages in the network of Figure 1.

Detailed Description of Certain Embodiments

In the telecommunications network of Figure 1, a first telephone exchange 1 is coupled to a subscriber terminal 2 via an ISDN access network (i.e. which uses the DSS1 signalling protocol), whilst a second exchange 3 is coupled to a subscriber terminal 4 via a PSTN access network. Interexchange signalling within the network is carried using ISUP protocol messages requiring the provision at the PSTN exchange 3 of a PSTN/ISUP interface 5. In the case of a call between the two subscriber terminals 2,4, the terminal 2 from which the call is established is referred to as the "calling party" whilst the other terminal 4 is referred to as the "called party". It will also be appreciated that the terminals 2,4 may be connected to respective access exchanges 1,2 via intermediate routing nodes (e.g. multiplexers/demultiplexers).

The following description builds upon the disclosures of the ITU H.323 standard which makes mandatory the use of a Q.931 based standard for establishing and maintaining a call connection between two H.323 enabled terminals. In the example illustrated in Figure 1, the two exchanges 1,3 of the telecommunications network communicate via respective H.323 enabled terminals 6,7 which in turn communicate with each other over an IP based network 8. At the H.323 terminals 6,7, the H.323 protocol stacks lie on top of TCP/IP protocol layers such that the H.323 data may be conveyed between the

exchanges over the IP network 8. Thus, at each exchange there exists a protocol stack consisting of ISUP over Q.931 over TCP/IP.

Consider the situation where the calling party 2 wishes to send certain User-to-User signalling information to the called party 4 during the call set-up procedure and which is facilitated by the ISDN access network available to the calling party 2. This information may include, for example, call forwarding information, call waiting information, or the like. The information is encapsulated at the access exchange 1,6 in an appropriate Q.931 message and is sent over the H.323 network 8 to the terminating exchange 3,5,7. Now assume that the terminating exchange 3 is incapable of making use of the received User-to-User signalling information. In this case the terminating exchange 3 must generate a Network Discard Indicator message, encapsulate it within a Q.931 message, and transmit the resulting Q.931 message back to the originating exchange over the IP network 8.

The Q.931 standard defines a NOTIFY message having the following structure, where the Reference indicates the corresponding Information element reference in the Q.931 standard, Direction indicates the direction(s) in which an element may be carried by the NOTIFY message (n = network, u = H.323 user), and Length indicates the length of the element in octets:

Information element	Reference (subclause)	Direction	Type	Length
Protocol discriminator	4.2	Both	M	1
Call reference	4.3	Both	M	2
Message type	4.4	Both	M	1

Bearer capability	4.5	n → u	O	2-12
Notification indicator	4.5	Both	M	3
Display	4.5	n → u	O	≥2

Of the six message elements, the Notification Indicator element is defined in the existing Q.931 standard as having three meaningful values or states. These are:

Bits 7	6	5	4	3	2	1	
0	0	0	0	0	0	0	User suspended
0	0	0	0	0	0	1	User resumed
0	0	0	0	0	1	0	Bearer service change

All other values are currently reserved.

What is proposed here is an extension to the Q.931 protocol to provide for the Network Discard Indicator message. This message is assigned to any one of the reserved values of the Notification Indicator element.

Figure 2 is a flow chart illustrating the steps involved in relaying a Network Discard Indicator message from the PSTN exchange 3 to the ISDN exchange 1.

It will be appreciated by the person of skill in the art that various modifications may be made to the above described embodiment without departing from the scope of the present invention. For example, whilst the above embodiment describes the inclusion of the Network Discard Indicator message in the Q.931 NOTIFY message, other messages may be used for which there currently exists reserved values. The exchanges (or switches) between which the Network Discard Indicator message is

sent may be coupled via one or more intermediate switches, with the IP network extending only over an intermediate portion of the signalling connection, e.g. between two intermediate exchanges. In such a case, the Network Discard Indicator message may be generated either at the terminating or originating exchange, or at one of the intermediate exchanges. The Network Discard Indicator message may be placed directly onto the IP network by the exchange at which the message is generated, or it may first be transmitted to an intermediate exchange over, for example, a Signalling System No.7 (SS7) signalling network.

Claims

1. A method of communicating signalling data between a pair of telecommunication switches employing ISUP signalling, via a packet switched data network, the method comprising using H.323 protocol to communicate over the data network where signalling data is carried by a Q.931 based protocol extended to provide for the transmission of the ISUP Network Discard Indicator message.

2. A method according to claim 1, wherein the extended Q.931 protocol is arranged to be applied within an H.323 protocol stack.

3. A method according to claim 2, wherein said connection or part of a connection formed between the subscriber parties is provided over a TCP/IP network.

4. A method according to claim 3, wherein the H.323 protocol stack is provided over a TCP/IP protocol stack.

5. Apparatus for communicating signalling data between a pair of telecommunication network switches employing ISUP signalling, via a packet switched data network, the apparatus comprising means for using H.323 protocol to communicate over the data network where signalling data is carried by a Q.931 based protocol extended to provide for the transmission of Network Discard Indicator messages.

Abstract (57)
A method of communicating signalling data between a pair of telecommunication exchanges (1,3) employing ISUP signalling, via a packet switched data network. The method comprising using H.323 protocol to communicate over the data network where signalling data is carried by a Q.931 based protocol extended to provide for the transmission of the ISUP Network Discard Indicator message.
Fig. 1

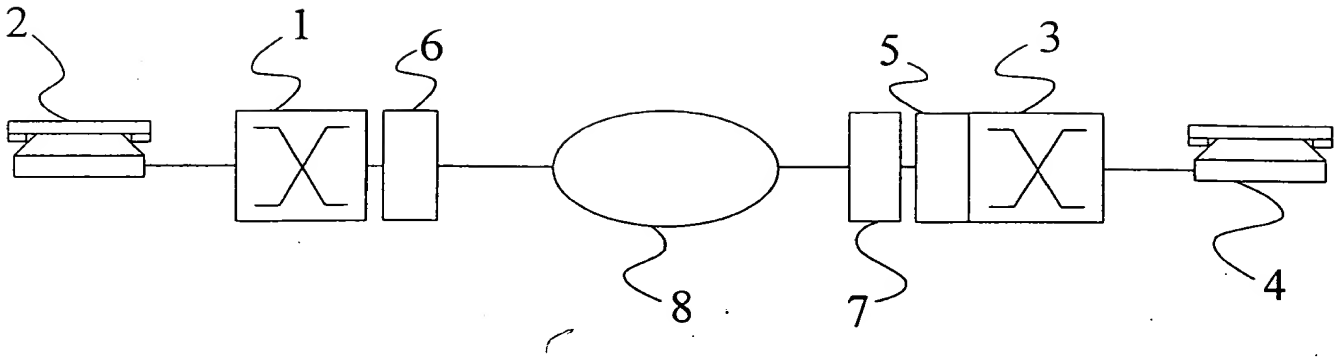

Figure 1

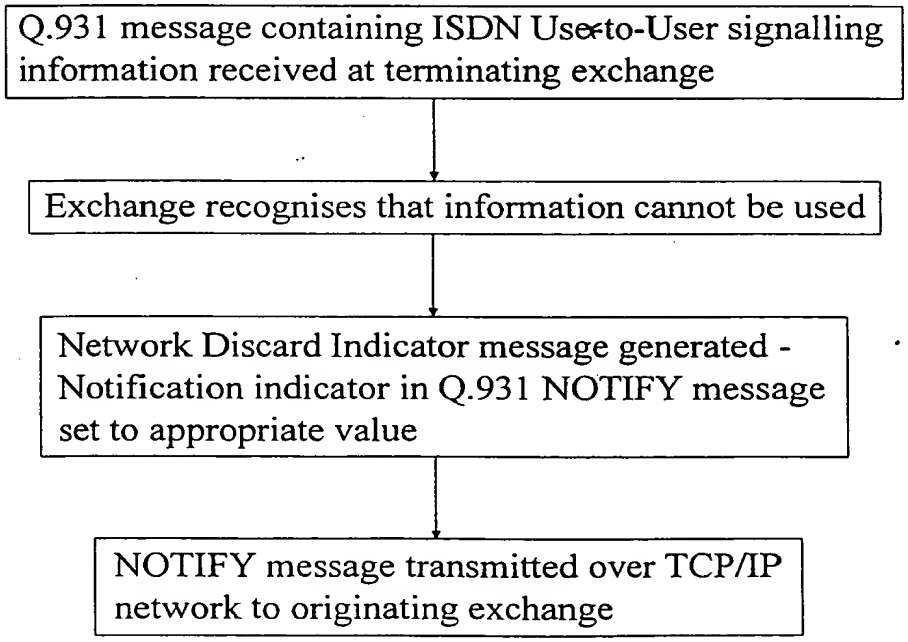

Figure 2